EVALUATION OF THE PATIENT AND PREOPERATIVE PREPARATION

Processed EEG and Anesthetic Depth

Intraoperative teaching · CA-2

THE QUESTION

Where the evidence disagrees

This topic was selected because an evidence synthesis beats a textbook on it: the trials disagree, or the guidance has moved recently.

THE EVIDENCE

What each source contributes, and how strong it is

Study design first — a cohort and a randomised trial do not carry the same weight.

Design	Year	Journal	What it found
Guideline	2023	Neurocritical care	An international expert panel judged frontal processed EEG adequate for monitoring
Meta-analysis	2023	British journal of anaesthesia	Across nine trials and 4,648 patients, processed EEG guidance gave a pooled odds
Randomised trial	2004	England)	In adults at high risk of awareness having relaxant general anaesthesia, BIS-guided
Cohort	2022	Anesthesiology	Isoelectric EEG occurred in 32% of children aged three years or under during
Review	2026	Anesthesia and analgesia	Processed EEG indices may not reliably reflect hypnotic state in neonates and infants
Guideline	2020	Anesthesia and analgesia	The POQI consensus recommends EEG monitoring as part of the vital organ monitors

6 resolved citations behind this deck; every point above traces to one of them.

WHERE THE GUIDANCE SITS

What the guidelines and pooled evidence say

3 findings, each on the slide that follows.

NEUROCRITICAL CARE 2023

An international expert panel judged frontal processed EEG adequate for monitoring

An international expert panel judged frontal processed EEG adequate for monitoring sedation depth in ICU patients unfit for clinical evaluation

BRITISH JOURNAL OF ANAESTHESIA 2023

Across nine trials and 4,648 patients, processed EEG guidance gave a pooled odds

Across nine trials and 4,648 patients, processed EEG guidance gave a pooled odds ratio for delirium of 0.78 that did not reach significance, with…

ANESTHESIA AND ANALGESIA 2020

The POQI consensus recommends EEG monitoring as part of the vital organ monitors

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WHERE THE GUIDANCE SITS

An international expert panel judged frontal processed EEG adequate for monitoring

Guideline · Neurocritical care

An international expert panel judged frontal processed EEG adequate for monitoring sedation depth in ICU patients unfit for clinical evaluation, but only after staff complete specific training.

Processed Electroencephalogram-Based Monitoring to Guide Sedation in Critically Ill Adult Patients: Recommendations From an International Expert Panel-Based Consensus, Neurocritical care 2023 · PMID 35896766

WHERE THE GUIDANCE SITS

Across nine trials and 4,648 patients, processed EEG guidance gave a pooled odds

Meta-analysis · British journal of anaesthesia

Across nine trials and 4,648 patients, processed EEG guidance gave a pooled odds ratio for delirium of 0.78 that did not

reach significance, with substantial heterogeneity.

Processed Electroencephalography-Guided General Anaesthesia to Reduce Postoperative Delirium: A Systematic Review and Meta-Analysis, British journal of anaesthesia 2023 · PMID 35183345

WHERE THE GUIDANCE SITS

The POQI consensus recommends EEG monitoring as part of the vital organ monitors

Guideline · Anesthesia and analgesia

The POQI consensus recommends EEG monitoring as part of the vital organ monitors, while finding insufficient evidence to recommend it for preventing delirium, neurocognitive disorder or postoperative mortality.

American Society for Enhanced Recovery and Perioperative Quality Initiative Joint Consensus Statement on the Role of Neuromonitoring in Perioperative Outcomes: Electroencephalography, Anesthesia and analgesia 2020 · PMID 31764163

WHAT THE TRIALS FOUND

In adults at high risk of awareness having relaxant general anaesthesia, BIS-guided

Randomised trial · England)

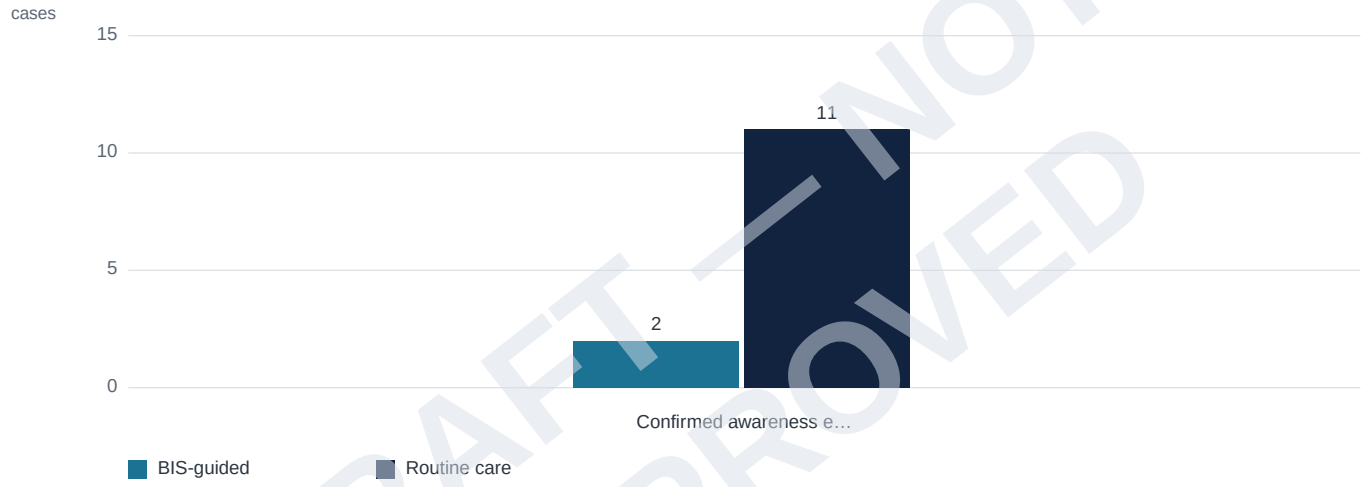
In adults at high risk of awareness having relaxant general anaesthesia, BIS-guided anaesthesia cut confirmed awareness from 11 cases to 2, a relative risk reduction of 82%.

Bispectral Index Monitoring to Prevent Awareness During Anaesthesia: The B-Aware Randomised Controlled Trial, Lancet (London, England) 2004 · PMID 15172773

THE NUMBERS

B-Aware: BIS cut confirmed awareness by 82%

2,463 adults at high risk, relaxant general anaesthesia.



The awareness benefit is the strongest thing processed EEG does, and it is separate from delirium.

Bispectral Index Monitoring to Prevent Awareness During Anaesthesia: The B-Aware Randomised Controlled Trial, Lancet (London, England) 2004 · PMID 15172773

IN PRACTICE

What the cohorts and reviews add

2 findings, each on the slide that follows.

ANESTHESIOLOGY 2022

Isoelectric EEG occurred in 32% of children aged three years or under during

Isoelectric EEG occurred in 32% of children aged three years or under during anaesthesia, varied from 9% to 88% between hospitals

ANESTHESIA AND ANALGESIA 2026

Processed EEG indices may not reliably reflect hypnotic state in neonates and infants

Processed EEG indices may not reliably reflect hypnotic state in neonates and infants, so read the raw waveform, spectral edge frequency and density…

IN PRACTICE

Isoelectric EEG occurred in 32% of children aged three years or under during

Cohort · Anesthesiology

Isoelectric EEG occurred in 32% of children aged three years or under during anaesthesia, varied from 9% to 88% between hospitals, and was associated with moderate and severe hypotension.

Isoelectric Electroencephalography in Infants and Toddlers During Anesthesia for Surgery: An International Observational Study, Anesthesiology 2022 · PMID 35503999

IN PRACTICE

Processed EEG indices may not reliably reflect hypnotic state in neonates and infants

Review · Anesthesia and analgesia

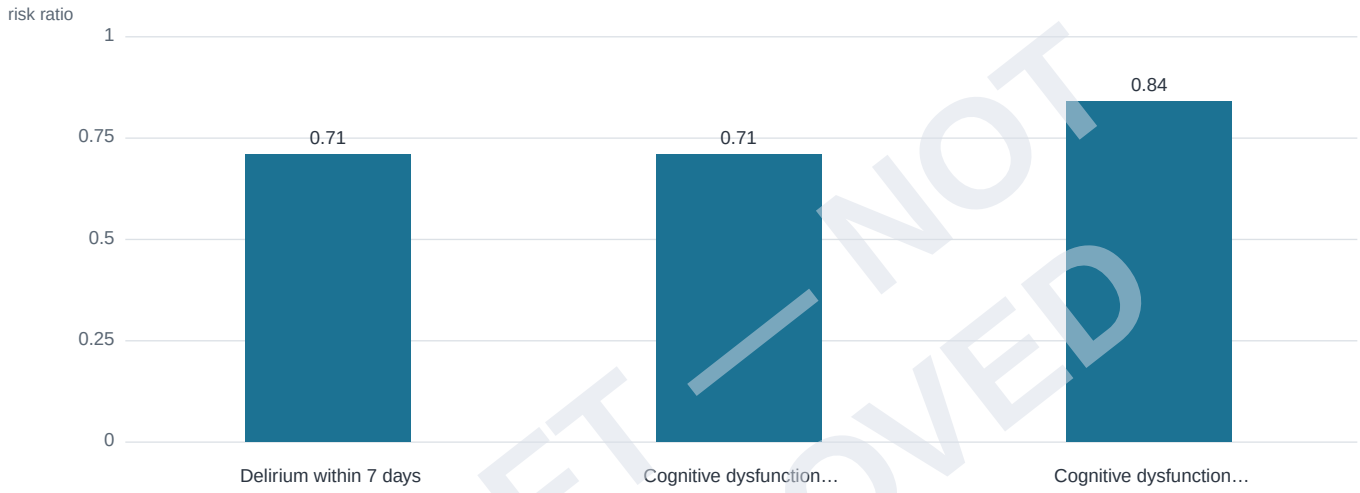
Processed EEG indices may not reliably reflect hypnotic state in neonates and infants, so read the raw waveform, spectral edge frequency and density spectral array rather than trusting the index alone.

The Utility of Electroencephalography in Guiding General Anesthesia in Children, Anesthesia and analgesia 2026 · PMID 39475857

THE NUMBERS

Delirium and cognitive dysfunction, pooled

Cochrane review, six trials, 2,929 participants.

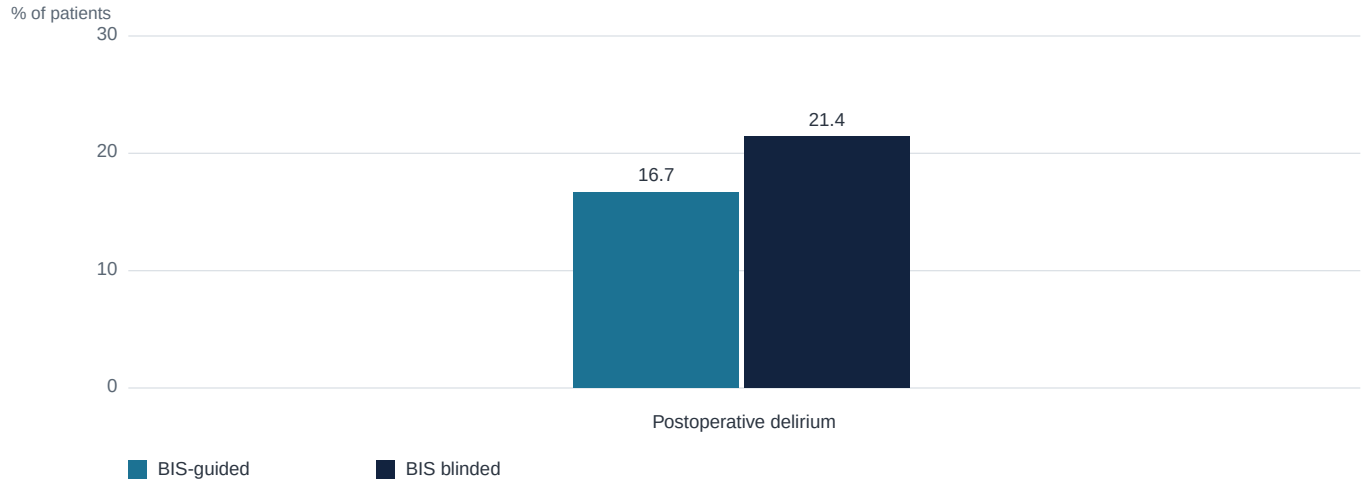


Moderate-quality evidence for delirium and 12-week cognition; the one-week effect is uncertain.

THE NUMBERS

Depth monitoring lowered delirium in older patients

1,155 patients over 60 analysed.



Time spent with BIS under 20 independently predicted delirium — the depth, not the monitor, is the exposure.

IN THE ROOM

What this changes about the next case

Colour is the strength of the evidence behind each step, not the urgency.

1. **1**
   An international expert panel judged frontal processed EEG adequate for monitoring sedation depth in ICU patients unfit for clinical evaluation, but only after staff complete specific training.
2. **2**
   The POQI consensus recommends EEG monitoring as part of the vital organ monitors, while finding insufficient evidence to recommend it for preventing delirium, neurocognitive disorder or postoperative mortality.
3. **3**
   Across nine trials and 4,648 patients, processed EEG guidance gave a pooled odds ratio for delirium of 0.78 that did not reach significance, with substantial heterogeneity.
4. **4**
   In adults at high risk of awareness having relaxant general anaesthesia, BIS-guided anaesthesia cut confirmed awareness from 11 cases to 2, a relative risk reduction of 82%.
5. **5**
   Isoelectric EEG occurred in 32% of children aged three years or under during anaesthesia, varied from 9% to 88% between hospitals, and was associated with moderate and severe hypotension.

KEY TAKEAWAYS

What to carry into the next case

An international expert panel judged frontal processed EEG adequate for monitoring
Neurocritical care 2023

Across nine trials and 4,648 patients, processed EEG guidance gave a pooled odds
British journal of anaesthesia 2023

In adults at high risk of awareness having relaxant general anaesthesia, BIS-guided
England) 2004

Isoelectric EEG occurred in 32% of children aged three years or under during
Anesthesiology 2022

An international expert panel judged frontal processed EEG adequate for monitoring

QUESTIONS I'LL ASK YOU IN THE ROOM

1. How does your plan change if the patient is not optimised?

2. What is the physiology behind what we just did?
3. Talk me through the trade-off you made there.
4. What would make you abandon this plan and do something else?

ORAL BOARDS STEM

> *A 74-year-old is having a long open aortic case under total intravenous anaesthesia. The processed EEG index sits at 32 for long stretches and the resident asks whether to titrate to it.*

BOARD QUESTIONS

1. You are anaesthetizing a neonate and the processed EEG index is displayed. According to a review of EEG use in children, why should the index alone not be trusted in neonates and infants, and which three elements of the EEG display should you read instead?
2. The B-Aware randomised controlled trial studied adults at high risk of awareness having general anaesthesia with neuromuscular blockade. State what BIS-guided anaesthesia did to confirmed awareness in that trial, giving the number of cases in each group and the relative risk reduction.
3. An international observational study recorded intraoperative EEG in children aged three years or under. State how often isoelectric EEG occurred overall, how much the rate varied between hospitals, and what clinical finding it was associated with.
4. The ASER/POQI joint consensus statement on neuromonitoring addressed electroencephalography. State both halves of its position: what it recommends about EEG monitoring, and the specific outcomes for which it found the evidence insufficient to recommend EEG.

ANSWER KEY

1. Processed EEG indices may not reliably reflect hypnotic state in neonates and infants, so read the raw waveform, spectral edge frequency and density spectral array rather than trusting the index alone.

In the youngest patients the single index number may not reflect hypnotic state at all, so look at the raw waveform, the spectral edge frequency and the density spectral array.

The Utility of Electroencephalography in Guiding General Anesthesia in Children, Anesthesia and analgesia 2026 · PMID 39475857

2. BIS-guided anaesthesia cut confirmed awareness from 11 cases to 2, a relative risk reduction of 82%.

B-Aware is the awareness trial, not a delirium or outcome trial: in high-risk adults receiving a relaxant, BIS guidance took confirmed awareness from 11 cases down to 2.

Bispectral Index Monitoring to Prevent Awareness During Anaesthesia: The B-Aware Randomised Controlled Trial, Lancet (London, England) 2004 · PMID 15172773

3. Isoelectric EEG occurred in 32% of children aged three years or under during anaesthesia, varied from 9% to 88% between hospitals, and was associated with moderate and severe hypotension.

Nearly a third of these young children went isoelectric at some point, and the nine-to-eighty-eight percent spread between hospitals tells you this is a practice variable, not an unavoidable one.

Isoelectric Electroencephalography in Infants and Toddlers During Anesthesia for Surgery: An International Observational Study, Anesthesiology 2022 · PMID 35503999

4. The POQI consensus recommends EEG monitoring as part of the vital organ monitors, while finding insufficient evidence to recommend it for preventing delirium, neurocognitive disorder or postoperative mortality.

Use the EEG as a vital organ monitor, which is what POQI endorses, but do not claim it prevents delirium, neurocognitive disorder or death, because POQI found the evidence insufficient for that.

American Society for Enhanced Recovery and Perioperative Quality Initiative Joint Consensus Statement on the Role of Neuromonitoring in Perioperative Outcomes: Electroencephalography, Anesthesia and analgesia 2020 · PMID 31764163

An international expert panel judged frontal processed EEG adequate for monitoring

SOURCES

[1] Processed Electroencephalogram-Based Monitoring to Guide Sedation in Critically Ill Adult Patients: Recommendations From an International Expert Panel-Based Consensus, Neurocritical care 2023 · PMID 35896766

[2] Processed Electroencephalography-Guided General Anaesthesia to Reduce Postoperative Delirium: A Systematic Review and Meta-Analysis, British journal of anaesthesia 2023 · PMID 35183345

[3] Bispectral Index Monitoring to Prevent Awareness During Anaesthesia: The B-Aware Randomised Controlled Trial, Lancet (London, England) 2004 · PMID 15172773

[4] Isoelectric Electroencephalography in Infants and Toddlers During Anesthesia for Surgery: An International Observational Study, Anesthesiology 2022 · PMID 35503999

[5] The Utility of Electroencephalography in Guiding General Anesthesia in Children, Anesthesia and analgesia 2026 · PMID 39475857

[6] American Society for Enhanced Recovery and Perioperative Quality Initiative Joint Consensus Statement on the Role of Neuromonitoring in Perioperative Outcomes: Electroencephalography, Anesthesia and analgesia 2020 · PMID 31764163